



## Configuring EtherChannel

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This chapter describes how to use the command-line interface (CLI) to configure EtherChannel on the Catalyst 6500 series switches. The configuration tasks in this chapter apply to Ethernet, Fast Ethernet, and Gigabit Ethernet switching modules and the uplink ports on the supervisor engine.



Note

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For complete syntax and usage information for the commands used in this chapter, refer to the *Catalyst 6500 Series Switch Command Reference* publication.

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This chapter consists of these sections:

- [Understanding How EtherChannel Works, page 6-1](#)
- [Understanding How EtherChannel Frame Distribution Works, page 6-2](#)
- [Port Aggregation Control Protocol and Link Aggregation Control Protocol, page 6-2](#)
- [EtherChannel Configuration Guidelines, page 6-3](#)
- [Understanding How the Port Aggregation Protocol Works, page 6-5](#)
- [Configuring EtherChannel Using PAGP, page 6-7](#)
- [Understanding How the Link Aggregation Control Protocol Works, page 6-12](#)
- [Configuring EtherChannel Using LACP, page 6-14](#)



Note

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You can use the commands in the following sections on all Ethernet ports in the Catalyst 6500 series switches.

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## Understanding How EtherChannel Works

EtherChannel aggregates the bandwidth of up to eight compatibly configured ports into a single logical link. A Catalyst 6500 series switch supports a maximum of 128 EtherChannels. All Ethernet ports on all modules, including those on a standby supervisor engine, support EtherChannel with no requirement that ports be contiguous or on the same module. All ports in each EtherChannel must be the same speed.



Note

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With software release 6.3(1) and later releases, due to the port ID handling by the spanning tree feature, the maximum supported number of EtherChannels is 126 for a 6- or 9-slot chassis and 63 for a 13-slot chassis.

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**Note**

The network device to which a Catalyst 6500 series switch is connected may impose its own limits on the number of ports in an EtherChannel.

If a link within an EtherChannel fails, the traffic previously carried over the failed link switches to the remaining links within the EtherChannel. Inbound broadcast and multicast packets on one link in an EtherChannel are blocked from returning on any other link of the EtherChannel.

You can configure EtherChannels as trunks. After a channel is formed, configuring any port in the channel as a trunk applies the configuration to all ports in the channel. Identically configured trunk ports can be configured as an EtherChannel.

## Understanding How EtherChannel Frame Distribution Works

EtherChannel distributes frames across the links in a channel by reducing part of the binary pattern formed from the addresses in the frame to a numerical value that selects one of the links in the channel.

EtherChannel frame distribution is based on a Cisco-proprietary hashing algorithm. The algorithm is deterministic; given the same addresses and session information, you always hash to the same port in the channel, preventing out-of-order packet delivery.

The address may be a source, a destination, or a combination of two IP addresses, two MAC addresses, or two TCP/UDP port numbers depending on the policy adopted through the **ip**, **mac**, or **session** options of the **set port channel all distribution** command. See the [“Configuring EtherChannel Load Balancing” section on page 6-11](#) for detailed information.

**Note**

The **set port channel all distribution session** command is supported on Supervisor Engine 2 only.

EtherChannel frame distribution is not configurable on all supervisor engines. Enter the **show module** command on a supervisor engine to determine if EtherChannel frame distribution is configurable on your switch. If the display shows the “Sub-Type” to be “L2 Switching Engine I WS-F6020,” then EtherChannel frame distribution is not configurable on your Catalyst 6500 series switch; the switch uses source and destination Media Access Control (MAC) addresses.

EtherChannel frame distribution is configurable with all other switching engines. The default is to use source and destination IP addresses.

## Port Aggregation Control Protocol and Link Aggregation Control Protocol

Port Aggregation Control Protocol (PAgP) and Link Aggregation Control Protocol (LACP) are two different protocols that allow ports with similar characteristics to form a channel through dynamic negotiation with adjoining switches. PAgP is a Cisco-proprietary protocol that can be run only on Cisco switches and those switches that are released by licensed vendors. LACP, which is defined in IEEE 802.3ad, allows Cisco switches to manage Ethernet channeling with devices that conform to the 802.3ad specification.

**Note**

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MAC address notification settings are ignored on PAgP and LACP EtherChannel ports.

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To use PAgP, see the “[Understanding How the Port Aggregation Protocol Works](#)” section on page 6-5. To use LACP, see the “[Understanding How the Link Aggregation Control Protocol Works](#)” section on page 6-12.

## EtherChannel Configuration Guidelines

If improperly configured, some EtherChannel ports are disabled automatically to avoid network loops and other problems.

**Note**

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Except where specifically differentiated, these guidelines apply to both PAgP and LACP.

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These sections provide the guidelines for EtherChannel configuration:

- [Port Configuration Guidelines, page 6-3](#)
- [VLAN and Trunk Configuration Guidelines, page 6-4](#)
- [Interaction with Other Features Guidelines, page 6-4](#)

## Port Configuration Guidelines

This section describes the guidelines for port configuration:

- You can have a maximum of eight compatibly configured ports per EtherChannel; the ports do not have to be contiguous or on the same module.

**Note**

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To configure the EtherChannel across different modules, you must put the ports in the same administrative group using the **set port channel** *port\_list admin\_group* command.

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- All ports in an EtherChannel must use the same protocol; you cannot run two protocols on one module.
- PAgP and LACP are not compatible; both ends of a channel must use the same protocol.

**Note**

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Switches can be configured manually with PAgP on one side and LACP on the other side in the **on** mode.

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- You can change the protocol at any time, but this change causes all existing EtherChannels to reset to the default channel mode for the new protocol.
- Configure all ports in an EtherChannel to operate at the same speed and duplex mode (full duplex only for LACP mode).
- Enable all ports in an EtherChannel. If you disable a port in an EtherChannel, it is treated as a link failure and its traffic is transferred to one of the remaining ports in the EtherChannel.
- A port cannot belong to more than one channel group at the same time.

- Ports with different port path costs, set by the **set spantree portcost** command, can form an EtherChannel as long as they are otherwise compatibly configured. Setting different port path costs does not, by itself, make ports incompatible for the formation of an EtherChannel.
- PAgP and LACP manage channels differently. When all the ports in a channel get disabled, PAgP removes them from its internal channels list; **show** commands do not display the channel. With LACP, when all the ports in a channel get disabled, LACP does not remove the channel; **show** commands continue to display the channel even though all its ports are down. To determine if a channel is actively sending and receiving traffic with LACP, use the **show port** command to see if the link is up or down.
- LACP does not support half-duplex links. If a port is in active/passive mode and becomes half duplex, the port is suspended (and a syslog message is generated). The port is shown as “connected” using the **show port** command and as “not connected” using the **show spantree** command. This discrepancy is because the port is physically connected but never joined spanning tree. To get the port to join spanning tree, either set the duplex to full or set the channel mode to off for that port. With software release 7.3(1) and later releases, LACP behavior for half-duplex links has changed and affected ports are no longer suspended. Instead of suspending a port, LACP PDU transmission (if any) is suppressed. If the port is part of a channel, the port is detached from the channel but still functions as a nonchannel port. A syslog message is generated when this condition occurs. Normal LACP behavior is reenabled automatically when the link is set back to full duplex.

## VLAN and Trunk Configuration Guidelines

This section describes the guidelines for VLAN and trunk-related configuration:

- Assign all ports in an EtherChannel to the same VLAN, or configure them as trunk ports.
- If you configure the EtherChannel as a trunk, configure the same trunk mode on all the ports in the EtherChannel. Configuring ports in an EtherChannel in different trunk modes can have unexpected results.
- An EtherChannel supports the same allowed range of VLANs on all the ports in a trunking EtherChannel. If the allowed range of VLANs is not the same for a port list, the ports do not form an EtherChannel even when set to the **auto** or **desirable** mode with the **set port channel** command.
- Do not configure the ports in an EtherChannel as dynamic VLAN ports. Doing so can adversely affect switch performance.
- Ports with different VLAN cost configurations cannot form a channel.

## Interaction with Other Features Guidelines

This section describes the guidelines that are associated with EtherChannel’s interaction with other features:

- An EtherChannel will not form with ports that have different GARP VLAN Registration Protocol (GVRP), GARP Multicast Registration Protocol (GMRP), and QoS configurations.
- An EtherChannel will not form with ports where the port security feature is enabled. You cannot enable the port security feature for ports in an EtherChannel.
- An EtherChannel will not form if one of the ports is a SPAN destination port.
- An EtherChannel will not form if protocol filtering is set differently on the ports.
- Cisco Discovery Protocol (CDP) runs on the physical port even after the port is added to a channel.

- VLAN Trunking Protocol (VTP) and Dual Ring Protocol (DRiP) run on the channel.
- During fast switchover to the standby supervisor engine, all channeling ports are cleared on its channeling configuration and state, and the links are pulled down temporarily to cause partner ports to reset. All ports are reset to the nonchanneling state.
- Ports with different dot1q port types cannot form a channel.
- Ports with different jumbo frame configurations cannot form a channel.
- Ports with different dynamic configurations cannot form a channel.
- During high-availability switchover to the standby supervisor engine, all channeling ports remain operational. Ports are reset only if there are events missing during the switchover.

**Note**

With software release 6.3(1) and later releases, a PAgP-configured EtherChannel is preserved even if it contains only one port (this does not apply to LACP-configured EtherChannels). In software releases prior to 6.3(1), traffic was disrupted when you removed a 1-port channel from spanning tree and then added it to spanning tree as an individual port.

**Note**

With software release 6.3(1) and later releases, due to the port ID handling by the spanning tree feature, the maximum number of EtherChannels is 126 for a 6- or 9-slot chassis and 63 for a 13-slot chassis.

## Understanding How the Port Aggregation Protocol Works

**Note**

Use the information in these sections if you are configuring EtherChannel using PAgP. If you are using LACP, see the [“Understanding How the Link Aggregation Control Protocol Works”](#) section on page 6-12.

These sections describe PAgP:

- [PAgP Modes, page 6-5](#)
- [PAgP Administrative Groups, page 6-6](#)
- [PAgP EtherChannel IDs, page 6-7](#)

### PAgP Modes

PAgP facilitates the automatic creation of EtherChannels by exchanging packets between Ethernet ports. PAgP packets are exchanged only between ports in **auto** and **desirable** modes. Ports configured in **on** or **off** mode do not exchange PAgP packets. The protocol learns the capabilities of port groups dynamically and informs the other ports. After PAgP identifies correctly matched EtherChannel links, it groups the ports into an EtherChannel. The EtherChannel is then added to the spanning tree as a single bridge port.

EtherChannel includes four user-configurable modes: **on**, **off**, **auto**, and **desirable**. Only **auto** and **desirable** are PAgP modes. You can modify the **auto** and **desirable** modes with the **silent** and **non-silent** keywords. By default, ports are in **auto silent** mode.

Table 6-1 describes the EtherChannel modes that are available in PAgP.

**Table 6-1 EtherChannel Modes Available in PAgP**

Mode	Description
<b>on</b>	Mode that forces the port to channel without PAgP. With the <b>on</b> mode, a usable EtherChannel exists only when a port group in <b>on</b> mode is connected to another port group in <b>on</b> mode.
<b>off</b>	Mode that prevents the port from channeling.
<b>auto</b>	PAgP mode that places a port into a passive negotiating state in which the port responds to PAgP packets that it receives but does not initiate PAgP packet negotiation. (Default)
<b>desirable</b>	PAgP mode that places a port into an active negotiating state in which the port initiates negotiations with other ports by sending PAgP packets.
<b>silent</b>	Keyword that is used with the <b>auto</b> or <b>desirable</b> mode when no traffic is expected from the other device to prevent the link from being reported to the Spanning Tree Protocol as down. (Default)
<b>non-silent</b>	Keyword that is used with the <b>auto</b> or <b>desirable</b> mode when traffic is expected from the other device.

Both the **auto** and **desirable** modes allow ports to negotiate with connected ports to determine if they can form an EtherChannel, based on criteria such as port speed, trunking state, and VLAN numbers.

Ports can form an EtherChannel when they are in different PAgP modes as long as the modes are compatible, as follows:

- A port in **desirable** mode can form an EtherChannel successfully with another port that is in **desirable** or **auto** mode.
- A port in **auto** mode can form an EtherChannel with another port in **desirable** mode.
- A port in **auto** mode cannot form an EtherChannel with another port that is also in **auto** mode, because neither port will initiate negotiation.

When configurable, EtherChannel frame distribution can use MAC addresses, IP addresses, and Layer 4 port numbers. You can specify either the source or the destination address or both the source and destination addresses and Layer 4 port numbers. The mode you select applies to all EtherChannels that are configured on the switch. Use the option that provides the greatest variety in your configuration. For example, if the traffic on a channel is going to a single MAC address only, using source addresses, IP addresses, or Layer 4 port numbers as the basis for frame distribution may provide better frame distribution than selecting MAC addresses as the basis.

## PAgP Administrative Groups

Configuring an EtherChannel creates an administrative group, which is designated by an integer between 1 and 1024, to which the EtherChannel belongs. When an administrative group is created, you can assign an administrative group number or let the next available administrative group number be assigned automatically. Forming a channel without specifying an administrative group number creates a new automatically numbered administrative group. An administrative group may contain a maximum of eight ports.

## PAgP EtherChannel IDs

Each EtherChannel is automatically assigned a unique EtherChannel ID. Use the **show channel group admin\_group** command to display the EtherChannel ID.

## Configuring EtherChannel Using PAgP

These sections describe how to configure EtherChannel using PAgP:

- [Specifying the EtherChannel Protocol, page 6-7](#)
- [Configuring an EtherChannel, page 6-8](#)
- [Setting the EtherChannel Port Mode, page 6-8](#)
- [Setting the EtherChannel Port Path Cost, page 6-8](#)
- [Setting the EtherChannel VLAN Cost, page 6-9](#)
- [Configuring EtherChannel Load Balancing, page 6-11](#)
- [Displaying EtherChannel Traffic Utilization, page 6-11](#)
- [Displaying Outgoing Ports for a Specified Address or Layer 4 Port Number, page 6-12](#)
- [Disabling an EtherChannel, page 6-12](#)



Note

Before you configure the EtherChannel, see the “[EtherChannel Configuration Guidelines](#)” section on [page 6-3](#).

## Specifying the EtherChannel Protocol



Note

The default protocol is PAgP.



Note

You can specify only one protocol, PAgP or LACP, per module.

To specify the EtherChannel protocol, perform this task in privileged mode:

Task	Command
Specify the EtherChannel protocol.	<b>set channelprotocol [pagp   lacp] mod</b>

This example shows how to specify the PAgP protocol for module 3:

```
Console> (enable) set channelprotocol pagp 3
Channeling protocol set to PAGP for module(s) 3.
Console> (enable)
```

## Configuring an EtherChannel

To configure an EtherChannel on a group of Ethernet ports, perform this task in privileged mode:

Task	Command
Configure an EtherChannel on the desired ports.	<b>set port channel</b> <i>mod/ports...</i> [ <i>admin_group</i> ] <b>set port channel</b> <i>mod/ports...</i> <b>mode</b> { <b>on</b>   <b>off</b>   <b>desirable</b>   <b>auto</b> } [ <b>silent</b>   <b>non-silent</b> ]

This example shows how to configure a seven-port EtherChannel in a new administrative group:

```
Console> (enable) set port channel 2/2-8 mode desirable
Ports 2/2-8 left admin_group 1.
Ports 2/2-8 joined admin_group 2.
Console> (enable)
```

## Setting the EtherChannel Port Mode

To set a port's EtherChannel mode, perform this task in privileged mode:

Task	Command
Set a port's EtherChannel mode.	<b>set port channel</b> <i>mod/ports...</i> [ <i>admin_group</i> ] <b>set port channel</b> <i>mod/port</i> <b>mode</b> { <b>on</b>   <b>off</b>   <b>desirable</b>   <b>auto</b> } [ <b>silent</b>   <b>non-silent</b> ]

This example shows how to set port 2/1 to **auto** mode:

```
Console> (enable) set port channel 2/1 mode auto
Ports 2/1 channel mode set to auto.
Console> (enable)
```

## Setting the EtherChannel Port Path Cost



### Note

You accomplish this task using a global command that configures both LACP and PAgP.

The channel path cost is achieved by adjusting the port costs of each port belonging to the channel. If you do not specify the cost, it is updated based on the current port costs of the channeling ports. You may address one channel or all channels.

To set the EtherChannel port path cost, perform this task in privileged mode:

	Task	Command
Step 1	Use the administrative group number to display the EtherChannel ID.	<b>show channel group</b> <i>admin_group</i> or <b>show lacp-channel group</b> <i>admin_key</i>
Step 2	Use the EtherChannel ID to set the EtherChannel port path cost.	<b>set spantree channelcost</b> { <i>channel_id</i>   <b>all</b> } <i>cost</i>



#### Note

When you enter the **set spantree channelcost** command, it does not appear in the configuration file. The command causes a “set spantree portcost” entry to be created for each port in the channel. See the “Configuring the PVST+ Port Cost” section in Chapter 8, “Configuring Spanning Tree,” for information on using the **set spantree portcost** command.

This example shows how to set the EtherChannel port path cost for channel ID 768:

```

Console> (enable) show channel group 20
Admin Port  Status      Channel  Channel
group                               Mode     id
-----
   20    1/1 notconnect on          768
   20    1/2  connected on          768

Admin Port  Device-ID                               Port-ID           Platform
group
-----
   20    1/1
   20    1/2  066510644 (cat26-1nf (NET25))    2/1              WS-C6009
Console> (enable)

Console> (enable) set spantree channelcost 768 12
Port(s) 1/1,1/2 port path cost are updated to 31.
Channel 768 cost is set to 12.
Warning:channel cost may not be applicable if channel is broken.
Console> (enable)

```

## Setting the EtherChannel VLAN Cost



#### Note

You accomplish this task using a global command that configures both LACP and PAgP.

The EtherChannel VLAN cost feature provides load balancing of VLAN traffic across multiple channels that are configured with trunking.

You enter the **set spantree channelvlancost** command to set the initial spanning tree costs for all VLANs in the channel. The **set spantree channelvlancost** command provides an alternate cost for some of the VLANs in the channel (assuming that you are trunking across the channel). This command allows you to have up to two different spanning tree costs assigned per channel; some VLANs in the channel can have the “vlancost” while the remaining VLANs in the channel have the “cost.”

The **set spantree channelvlancost** command creates a “set spantree portvlancost” entry to the configuration file for each port in the channel. Once you have entered the **set spantree channelvlancost** command, you must enter the **set spantree portvlancost** command for at least one port in the channel, specifying the VLAN or VLANs that you want associated with each port. This example shows what occurs when each command is entered:

```
Console> (enable) set spantree channelvlancost 856 10
Port(s) 3/47-48 vlan cost are updated to 16.
Channel 856 vlancost is set to 10.
```

These commands are added to the configuration file:

- **set spantree portvlancost 3/47 cost 16**
- **set spantree portvlancost 3/48 cost 16**

Now you have to add the desired VLANs to the above created commands by entering this command:

```
Console> (enable) set spantree portvlancost 3/47 cost 16 1-1005
Port 3/47 VLANs 1025-4094 have path cost 19.
Port 3/47 VLANs 1-1005 have path cost 16.
Port 3/48 VLANs 1-1005 have path cost 16.
```

To set the EtherChannel VLAN cost, perform this task in privileged mode:

	Task	Command
Step 1	Use the administrative group number to display the EtherChannel ID.	<b>show channel group</b> <i>admin_group</i> or <b>show lacp-channel group</b> <i>admin_key</i>
Step 2	Use the EtherChannel ID to set the EtherChannel VLAN cost.	<b>set spantree channelvlancost</b> <i>channel_id cost</i>
Step 3	Configure the port cost for the desired VLANs on each port.	<b>set spantree portvlancost</b> { <i>mod/port</i> } [ <b>cost</b> <i>cost</i> ] [ <i>vlan_list</i> ]

This example shows how to set the EtherChannel VLAN cost for channel ID 856:

```
Console> (enable) show channel group 22
Admin Port  Status      Channel  Channel
group      Mode      id
-----
 22    1/1  notconnect  on          856
 22    1/2  connected   on          856

Admin Port  Device-ID                               Port-ID           Platform
group
-----
 22    1/1
 22    1/2  066510644 (cat26-1nf (NET25))    2/1               WS-C6009
Console> (enable)

Console> (enable) set spantree channelvlancost 856 10
Port(s) 3/47-48 vlan cost are updated to 16.
Channel 856 vlancost is set to 10.
Console> (enable) set spantree portvlancost 3/47 cost 16 1-1005
Port 3/47 VLANs 1025-4094 have path cost 19.
Port 3/47 VLANs 1-1005 have path cost 16.
Port 3/48 VLANs 1-1005 have path cost 16.
Console> (enable)
```

## Configuring EtherChannel Load Balancing

The load-balancing policy (frame distribution) can be based on a MAC address (Layer 2), an IP address (Layer 3), or a port number (Layer 4). These policies can be activated, respectively, by the **mac**, **ip** and **session** keywords. The load balancing can be based solely on the source address (**source** keyword), destination address (**destination** keyword), or both source and destination addresses (**both** keyword).

If a packet does not belong to a selected category, the next lower level category is considered. If the hardware cannot support the frame distribution method selected, a “Feature not supported” error message is displayed.

To configure EtherChannel load balancing, perform this task in privileged mode:

Task	Command
Configure EtherChannel load balancing.	<b>set port channel all distribution {ip   mac   session} [source   destination   both]</b>



### Note

The **set port channel all distribution session** command option is supported on Supervisor Engine 2 only.

This example shows how to configure EtherChannel to use MAC source addresses:

```
Console> (enable) set port channel all distribution mac source
Channel distribution is set to mac source.
Console> (enable)
```

## Displaying EtherChannel Traffic Utilization

To display the traffic utilization on the EtherChannel ports, perform this task:

Task	Command
Display traffic utilization.	<b>show channel traffic</b>

This example shows how to display traffic utilization on EtherChannel ports:

```
Console> (enable) show channel traffic
ChanId Port  Rx-Ucst Tx-Ucst Rx-Mcst Tx-Mcst Rx-Bcst Tx-Bcst
-----
   808  2/16   0.00%   0.00%  50.00%  75.75%   0.00%   0.00%
   808  2/17   0.00%   0.00%  50.00%  25.25%   0.00%   0.00%
   816  2/31   0.00%   0.00%  25.25%  50.50%   0.00%   0.00%
   816  2/32   0.00%   0.00%  75.75%  50.50%   0.00%   0.00%
Console> (enable)
```

## Displaying Outgoing Ports for a Specified Address or Layer 4 Port Number

To display the outgoing port used in an EtherChannel for a specific address or Layer 4 port number, perform this task:

Task	Command
Display the outgoing port for a specified address or Layer 4 port number.	<b>show channel hash</b> <i>channel_id src_ip_addr [dest_ip_addr]   dest_ip_address   src_mac_addr [dest_mac_addr]   dest_mac_addr   src_port dest_port   dest_port</i>

This example shows how to display the outgoing port for the specified source and destination IP addresses:

```
Console> (enable) show channel hash 808 172.20.32.10 172.20.32.66
Selected channel port:2/17
Console> (enable)
```

## Disabling an EtherChannel

To disable an EtherChannel, perform this task in privileged mode:

Task	Command
Disable an EtherChannel.	<b>set port channel</b> <i>mod/port mode off</i>

This example shows how to disable an EtherChannel:

```
Console> (enable) set port channel 2/2-8 mode off
Ports 2/2-8 channel mode set to off.
Console> (enable)
```

## Understanding How the Link Aggregation Control Protocol Works



### Note

Use the information in these sections if you are configuring EtherChannel using LACP. If you are using PAgP, see the “[Understanding How the Port Aggregation Protocol Works](#)” section on page 6-5.

This section contains the following descriptions:

- [LACP Modes, page 6-13](#)
- [LACP Parameters, page 6-13](#)

## LACP Modes

You may manually turn on channeling by setting the port channel mode to **on**, and you may turn off channeling by setting the port channel mode to **off**.

If you want LACP to handle channeling, use the **active** and **passive** channel modes. To start automatic EtherChannel configuration with LACP, you need to configure at least one end of the link to **active** mode to initiate channeling, because ports in **passive** mode passively respond to initiation and never initiate the sending of LACP packets.

Table 6-2 describes the EtherChannel modes available in LACP.

**Table 6-2 EtherChannel Modes Available in LACP**

Mode	Description
<b>on</b>	Mode that forces the port to channel without LACP. With the <b>on</b> mode, a usable EtherChannel exists only when a port group in <b>on</b> mode is connected to another port group in <b>on</b> mode.
<b>off</b>	Mode that prevents the port from channeling.
<b>passive</b>	LACP mode that places a port into a passive negotiating state in which the port responds to LACP packets that it receives but does not initiate LACP packet negotiation. (Default)
<b>active</b>	LACP mode that places a port into an active negotiating state in which the port initiates negotiations with other ports by sending LACP packets.

## LACP Parameters

The parameters used in configuring LACP are as follows:

- System priority

Each switch running LACP must be assigned a system priority that can be specified automatically or through the CLI (see the [“Specifying the System Priority” section on page 6-15](#)). The system priority is used with the switch MAC address to form the system ID and is also used during negotiation with other systems.

- Port priority

Each port in the switch must be assigned a port priority that can be specified automatically or through the CLI (see the [“Specifying the Port Priority” section on page 6-15](#)). The port priority is used with the port number to form the port identifier. The port priority is used to decide which ports should be put in standby mode when there is a hardware limitation that prevents all compatible ports from aggregating.

- Administrative key

Each port in the switch must be assigned an administrative key value that can be specified automatically or through the CLI (see the [“Specifying an Administrative Key Value” section on page 6-16](#)). The ability of a port to aggregate with other ports is defined with the administrative key. A port’s ability to aggregate with other ports is determined by these factors:

- Port physical characteristics, such as data rate, duplex capability, and point-to-point or shared medium
- Configuration constraints that you establish

When enabled, LACP always tries to configure the maximum number of compatible ports in a channel, up to the maximum that is allowed by the hardware (eight ports). If LACP is not able to aggregate all the ports that are compatible (for example, the remote system might have more restrictive hardware limitations), then all the ports that cannot be actively included in the channel are put in hot standby state and are used only if one of the channeled ports fails.

You can configure different channels with ports that have been assigned the same administrative key. For example, if eight ports are assigned the same administrative key, you may configure four ports in a channel using LACP **active** mode and the remaining four ports in a manually configured channel using the **on** mode. An administrative key is meaningful only in the context of the switch that allocates it; there is no global significance to administrative key values.

## Configuring EtherChannel Using LACP

These sections describe how to configure EtherChannel using LACP:

- [Specifying the EtherChannel Protocol, page 6-14](#)
- [Specifying the System Priority, page 6-15](#)
- [Specifying the Port Priority, page 6-15](#)
- [Specifying an Administrative Key Value, page 6-16](#)
- [Changing the Channel Mode, page 6-17](#)
- [Specifying the Channel Path Cost, page 6-17](#)
- [Specifying the Channel VLAN Cost, page 6-17](#)
- [Configuring Channel Load Balancing, page 6-17](#)
- [Clearing LACP Statistics, page 6-18](#)
- [Displaying EtherChannel Traffic Utilization, page 6-18](#)
- [Displaying Outgoing Ports for a Specified Address or Layer 4 Port Number, page 6-18](#)
- [Disabling an EtherChannel, page 6-19](#)
- [Displaying Spanning Tree-Related Information for EtherChannels, page 6-19](#)



Note

Before you configure the EtherChannel, see the “[EtherChannel Configuration Guidelines](#)” section on [page 6-3](#).

## Specifying the EtherChannel Protocol



Note

The default protocol is PAgP.



Note

You can specify only one protocol, PAgP or LACP, per module.

To specify the EtherChannel protocol, perform this task in privileged mode:

Task	Command
Specify the EtherChannel protocol.	<b>set channelprotocol</b> [ <b>pagp</b>   <b>lacp</b> ] <i>mod</i>

This example shows how to specify the LACP protocol for modules 2 and 3:

```
Console> (enable) set channelprotocol lacp 2,3
Mod 2 is set to LACP protocol.
Mod 3 is set to LACP protocol.
Console> (enable)
```

Use the **show channelprotocol** command to display the protocols for all modules.

## Specifying the System Priority



### Note

Although this command is a global option, the command applies only to modules on which LACP is enabled; it is ignored on modules running PAgP.

The system priority value must be a number from 1–65535, where higher numbers represent lower priority. The default priority is 32768.

To specify the system priority, perform this task in privileged mode:

Task	Command
Specify the system priority.	<b>set lacp-channel system-priority</b> <i>value</i>

This example shows how to specify the system priority as 20000:

```
Console> (enable) set lacp-channel system-priority 20000
LACP system priority is set to 20000
Console> (enable)
```

Use the **show lacp-channel sys-id** command to display the LACP system ID and system priority.

## Specifying the Port Priority

The port priority value must be a number from 1–255, where higher numbers represent lower priority. The default priority is 128.

To specify the port priority, perform this task in privileged mode:

Task	Command
Specify the port priority.	<b>set port lacp-channel</b> <i>mod/ports</i> <b>port-priority</b> <i>value</i>

This example shows how to specify the port priority as 10 for ports 1/1 to 1/4 and 2/6 to 2/8:

```
Console> (enable) set port lacp-channel 1/1-4,2/6-8 port-priority 10
Port(s) 1/1-4,2/6-8 port-priority set to 10.
Console> (enable)
```

Use the **show lacp-channel group *admin\_key* info** command to display the port priority.

## Specifying an Administrative Key Value



### Note

When the system or module configuration information stored in NVRAM is cleared, the administrative keys are assigned new values automatically. For modules, each group of four consecutive ports, beginning at the 1st, 5th, 9th and so on, are assigned a unique administrative key. Across the module, ports must have unique administrative keys. After NVRAM is cleared, the channel mode of the ports is set to “passive.”

You can specify an administrative key value to a set of ports or the system automatically selects a value if you do not specify the parameter *admin\_key*. In both cases, the *admin\_key* value can range from 1–1024.

If you choose a value for the administrative key, and this value has already been used in the system, then all the ports that were originally associated with the previously assigned *admin\_key* value are moved to another automatically assigned value, and the modules and ports that you specified in the command are assigned the *admin\_key* value that you specified.

The maximum number of ports to which an administrative key can be assigned is eight.

The default mode for all ports being assigned the administrative key is passive. However, if the channel was previously assigned a particular mode (see the [“Changing the Channel Mode” section on page 6-17](#)), assigning the administrative key will not affect it, and the channel mode that you specified previously is maintained.

To specify the administrative key value, perform this task in privileged mode:

Task	Command
Specify the administrative key value.	<b>set port lacp-channel <i>mod/ports</i> [<i>admin_key</i>]</b>

This example shows how to assign ports 4/1 to 4/4 the same administrative key, with the system picking its value automatically:

```
Console> (enable) set port lacp-channel 4/1-4
Port(s) 4/1-4 are assigned to admin key 96.
Console> (enable)
```

This example shows how to assign ports 4/4 to 4/6 the administrative key 96 (you specify the 96). In this example, the administrative key was previously assigned to another group of ports by the system (see the previous example):

```
Console> (enable) set port lacp-channel 4/4-6 96
Port(s) 4/1-3 are moved to admin key 97.
Port(s) 4/4-6 are assigned to admin key 96.
Console> (enable)
```

This example shows the system response when more than eight ports are assigned the same administrative key value (the request is denied, and no ports are assigned administrative key 123):

```
Console> (enable) set port lacp-port channel 2/1-2,4/1-8 123
No more than 8 ports can be assigned to an admin key.
Console> (enable)
```

Use the **show lacp-channel group** command to display administrative key values for ports.

## Changing the Channel Mode

You can change the channel mode for a set of ports that were previously assigned the same administrative key (see the [“Specifying an Administrative Key Value”](#) section on page 6-16).

To change the channel mode, perform this task in privileged mode:

Task	Command
Change the channel mode.	<b>set port lacp-channel</b> <i>mod/ports</i> <b>mode</b> [on   off   active   passive]

This example shows how to change the channel mode for ports 4/1 and 4/6, setting it to **on**. The administrative key for ports 4/1 and 4/6 is unchanged.

```
Console> (enable) set port lacp-channel 4/1,4/6 mode on
Port(s) 4/1,4/6 channel mode set to on.
Console> (enable)
```

Use the **show lacp-channel group** *admin\_key* command to display the channel mode for ports.

## Specifying the Channel Path Cost

You can specify the channel path cost by using a global command that configures both LACP and PAgP. For more information, see the [“Setting the EtherChannel Port Path Cost”](#) section on page 6-8.

## Specifying the Channel VLAN Cost

You can specify the channel VLAN cost by using a global command that configures both LACP and PAgP. For more information, see the [“Setting the EtherChannel VLAN Cost”](#) section on page 6-9.

## Configuring Channel Load Balancing

You can configure channel load balancing by using a global command that configures both LACP and PAgP. For more information, see the [“Configuring EtherChannel Load Balancing”](#) section on page 6-11.

## Clearing LACP Statistics

To clear LACP statistics, perform this task in privileged mode:

Task	Command
Clear LACP statistics.	<b>clear lacp-channel statistics</b>

This example shows how to clear LACP statistics:

```
Console> (enable) clear lacp-channel statistics
LACP channel counters are cleared.
Console> (enable)
```

## Displaying EtherChannel Traffic Utilization

To display the traffic utilization on the EtherChannel ports, perform this task:

Task	Command
Display traffic utilization on EtherChannel ports.	<b>show lacp-channel traffic</b>

This example shows how to display traffic utilization on EtherChannel ports:

```
Console> (enable) show lacp-channel traffic
ChanId Port  Rx-Ucst Tx-Ucst Rx-Mcst Tx-Mcst Rx-Bcst Tx-Bcst
-----
   808  2/16   0.00%  0.00%  50.00%  75.75%  0.00%  0.00%
   808  2/17   0.00%  0.00%  50.00%  25.25%  0.00%  0.00%
   816  2/31   0.00%  0.00%  25.25%  50.50%  0.00%  0.00%
   816  2/32   0.00%  0.00%  75.75%  50.50%  0.00%  0.00%
Console> (enable)
```

## Displaying Outgoing Ports for a Specified Address or Layer 4 Port Number

To display the outgoing port used in an EtherChannel for a specific address or Layer 4 port number, perform this task:

Task	Command
Display the outgoing port for a specified address or Layer 4 port number.	<b>show lacp-channel hash channel_id src_ip_addr [dest_ip_addr]   dest_ip_address   src_mac_addr [dest_mac_addr]   dest_mac_addr   src_port dest_port   dest_port</b>

This example shows how to display the outgoing port for the specified source and destination IP addresses:

```
Console> (enable) show lacp-channel hash 808 172.20.32.10 172.20.32.66
Selected channel port:2/17
Console> (enable)
```

## Disabling an EtherChannel

To disable an EtherChannel, perform this task in privileged mode:

Task	Command
Disable an EtherChannel.	<b>set port lacp-channel <i>mod/port</i> mode off</b>

This example shows how to disable an EtherChannel:

```
Console> (enable) set port lacp-channel 2/2-8 mode off
Port(s) 2/2-8 channel mode set to off.
Console> (enable)
```

## Displaying Spanning Tree-Related Information for EtherChannels

You can display the channel ID and the truncated port list for all ports that are channeling. Ports that are not channeling are identified by their port number.

To display spanning tree-related information for EtherChannels, perform this task:

Task	Command
Display spanning-tree related information for EtherChannels.	<b>show spantree <i>mod/port</i></b>

These examples show how to display spanning tree-related information for EtherChannels:

```
Console> show spantree 4/6
Port          Vlan Port-State   Cost  Priority Portfast  Channel_id
-----
4/6          1    not-connected  4     32 disabled  0
Console>
```

```
Console> show spantree 4/7
Port          Vlan Port-State   Cost  Priority Portfast  Channel_id
-----
4/7-8        1    blocking     3     32 disabled  770
Console>
```

